FuturePlus Systems Corporation

Agilent Technologies
Innovating the HP Way

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FBDIMM SLOT PROBE
FS2338

Users Manual

For use with Agilent Technologies Logic Analyzers

Revision 1.5

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Introduction

Thank you for purchasing the FuturePlus Systems FS2338 FBDIMM Slot Logic Analyzer Probe. We think you will find the FS2338, along with your Agilent Technologies Logic Analyzer, a valuable tool for helping to characterize and debug your FBDIMM-based systems. This Users Guide will provide the information you need to install, configure, and use the FBDIMM Slot Probe. If you have any questions about this Guide or use of this probe, please contact FuturePlus Systems Corporation.

Probe Performance Limitation

The FS2338 Slot probe is subject to the limitation inherent in probing the FBDIMM bus at 4 GHz and dependent on the "logic analyzer interface" decode function of the Advanced Memory Buffer chip used as an interface between the FBDIMM High speed signals and the DDR2 DRAMs resident on the FBDIMM. If you have any questions please contact FuturePlus Systems Tech Support.

Definitions

Logic Analyzer Modules
"Module" - A set of logic analyzer cards that have been configured (via cables connecting the cards) to operate as a single logic analyzer whose total available channels is the sum of the channels on each card. A trigger within a module can be specified using all of the channels of that module. Each module may be further broken up into "Machines". A single module may not extend beyond a single 5 card 16900 frame.

Logic Analyzer Machine
"Machine" - A set of logic analyzer pods from a logic analyzer module grouped together to operate as a single state or timing analyzer.

FS2338 Probe Description

The FS2338 FBDIMM Slot Probe is based on the "Logic Analyzer Interface (LAI) Mode" of the Advanced Memory Buffer chip used on Fully Buffered DIMMs. This mode allows decoding of the Southbound (from memory controller to FBDIMMs) Commands and Data as well as Northbound (from the FBDIMMs to the memory controller) Commands and Data. The probe can provide a single Southbound frame of 120 bits (10 lanes of 12 bits each) as well as a Northbound frame of 168 bits (14 lanes of 12 bits each) to the logic analyzer. Data capture at up to the maximum FBD speed of 4.8Gb/s is supported. On each line of the trace list a complete Northbound and Southbound frame is captured to simplify triggering. State Analysis of these frames is provided through the use of a Protocol Decoder.

The probe requires control through a SM bus provided by the logic analyzer. This control is provided with the probe that runs on the 16900 workspace and is linked to the probe thru the SMBus ports in the logic analyzer cards when used with the 1690x series Agilent Logic Analyzer frames. 16753/4/5/6 as well as 16950 cards are supported. This LAI control Probe Add-In allows the user complete control over the LAI mode functions of the AMB used in the FS2338 to control Set-up, Triggering, Store Qualification, and AMB Register parameters.

Probe Technical Feature Summary
- Quick and easy connection between a 240 pin FBDIMM connector and Agilent 1690x Logic Analyzers.
- Complete and accurate state analysis of North and Southbound FBDIMM traffic as seen by the Slot probe at maximum FBD speeds.
- Integrated control of Advanced Memory Buffer Logic Analyzer Interface functions.

Probe Components
The following components have been shipped with your FS2338 Probe:

- FS2338 Slot Probe with cable attached break-out card for logic analyzer connection

- 1 10" EV cable

- CD containing FBDIMM Protocol Decode software for 1690x frame or offline analysis, as well as the FBD Probe Control software

- This Users Guide and other information on CD-ROM.

- Quick Start Sheet.

- Software Entitlement Certificate for 1690x or offline analysis.

Signal Assignments on Probe Pods
There are signal connections for up to 6 different logic analyzer adapter cables
(E5378A). This provides the user with some flexibility in terms of which signals they
connect to based on the type of analysis that is needed, e.g. SB or NB only, all trigger
events, SB and NB traffic together, etc. The 16753/4/5/6 cards require the E5378A
adapter cables. 1 Adapter cable is required for 2 logic analyzer pods.

Logic Analyzer card requirements
The FS2338 FBDIMM Probe requires up to five logic analyzer cards depending on what
decode information is required by the user. There are several different configuration files
provided for the following applications. Note: all these configurations require the use of
16753/4/5/6 cards and Dual Sample Mode in the Logic Analyzer.

Configuration files – For Rev. 2 Paddle cards.

See User Manual rev. 1.2 or contact FuturePlus for rev. 1 Paddle Card configuration file
details

Probe Configuration	Configuration File	Probe Connections to the Analyzer	State Analysis requirement
SB and NB up to 533 Mb/s with 10 trigger bits	FB238_5	J10 (Master) Odd and Even, J13 Odd and Even, J9 Odd and Even, J11 Odd and Even, J12 Odd J15 Odd	3 cards configured as one module for speeds up to 533 Mb/s
SB Only and 8 Trigger bits	FB238_4	J9 Even, J10 (Master) Odd and Even, J12 Odd, J13 Odd and Even	3 cards configured as one module, one dual sample state machine
Full NB and SB with 5 Trigger bits	FB238_2	J9 Odd and Even, J10 (Master) Odd and Even, J11 Odd and Even, J12 Odd, J13 Odd and Even	5 cards configured as one module, one dual sample state machine
12 lane NB and SB with 10 Trigger bits	FB238_1	J9 Odd and Even, J10 (Master) Odd and Even, J11 Odd and Even, J12 Even, **J15 Odd**	5 cards configured as one module, one dual sample state machine **Using J15 Odd requires addition of jumpers on rev. 2 Paddle cards**

Rev. 2 Paddle Card

The Paddle card was redesigned in 2007 in order to maximize signal integrity at 800MT/s. In order to accomplish this, the wiring to the 6 existing adapter card connections on the Paddle Card was changed. This in turn creates some changes to the configuration files for the logic analyzer. This is why the set of configuration files provided with FS1129 are separated into those files for the Rev. 1 Paddle card and those for the Rev. 2 paddle card. Rev. 2 Paddle cards are identified with a label on the switch side of the board.

```
 2                100      2                100      2                100
    J9                        J15                       J10
 1                 99      1                 99      1                 99

 2                100      2                100      2                100
    J11                       J12                       J13
 1                 99      1                 99      1                 99
```
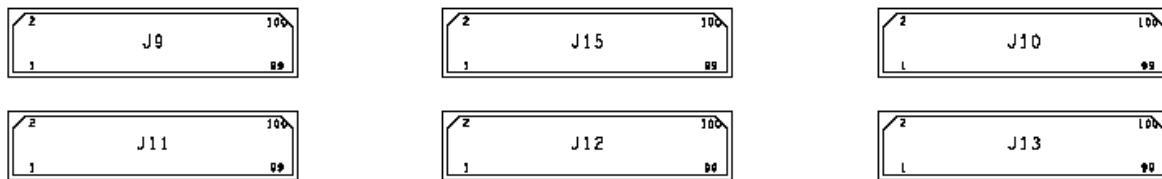
FBDIMM Paddle Board Connector layout

J15 Odd Paddle card connections

In order to minimize stubs on the Paddle card while providing the user with probe flexibility the connections to J15 are cutoff with 0402 resistor pads at their source. Looking on the backside of a rev. 2 Paddle card you can see the pads for R7 – R16. In order to make the signal connection to J15 0402 0 ohm resistors or wire must be soldered down in these locations.

```
R15 R13          R10 R8
□ □ □ □          □ □ □ □
R16 R14 R12      R11 R9 R7
```
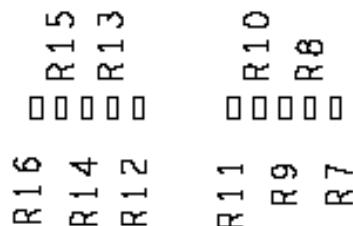
Software Requirements

For state analysis you must have version A.02.99.00 or later Agilent OS installed on the 1690x frame. Version A.02.99.00 contains the capability for SM bus control of the probe through the 16753/4/5/6 or 16950 cards.

Setting up the 169xx Analyzer
A CD containing the 16900 software is included in the FS2338 package. The CD contains a setup file that will automatically install the configuration files and protocol decoder onto a PC containing the 16900 operating system or onto a 16900 analyzer itself.

To install the software simply double click the FBDIMM.exe file on the CD containing the 16900 software. After accepting the license agreement the software should install within a couple of minutes.


169xx Licensing
Once the software has been successfully installed you must license the software. Please refer to the entitlement certificate for instructions on licensing the software. The software can only be installed on one machine. If you need to install the software on more than one machine you must contact the FuturePlus sales department to purchase additional licenses.

Loading 169xx configuration files and General Purpose Probe feature
When the software has been licensed you should be ready to load a configuration file. You can access the configuration files by clicking on the folder that was placed on the desktop. When you click on the folder it should open up to display all the configuration files to choose from. If you put your mouse cursor on the name of the file a description will appear telling you what the setup consists of, once you choose the configuration file that is appropriate for your configuration the 16900 operating system should execute it. The protocol decoder automatically loads when the configuration file is loaded. If the decoder does not load, you may load it by selecting tools from the menu bar at the top of the screen and select the decoder from the list.

After loading the configuration file of choice, the user should see both the Probe Control application icon and the FBDIMM configuration and decoder icon in the Probes column on the Overview page. Clicking on the Properties button of the FBDIMM Config icon will display the General Purpose Probe Set as defined for this configuration.

This is what the FS2338 probe user should use to guide them in connecting adapter cables to analyzer card pods.
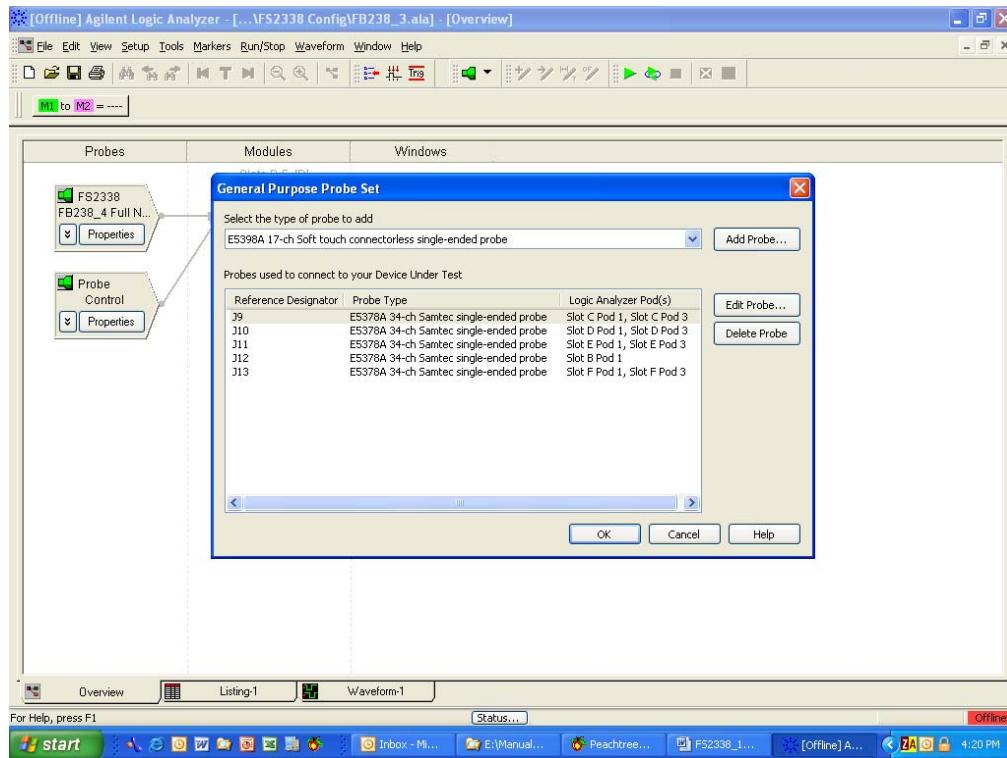
If the pod connections need to be changed, it can be done using the Edit Probes feature, which is shown below. The Reference Designator field should be J9 through J15 from the paddle card. The next step is to select on the right hand side of the screen the 2 pods (Odd and Even) to connect to the analyzer cards. The drop box will show available pod connections.
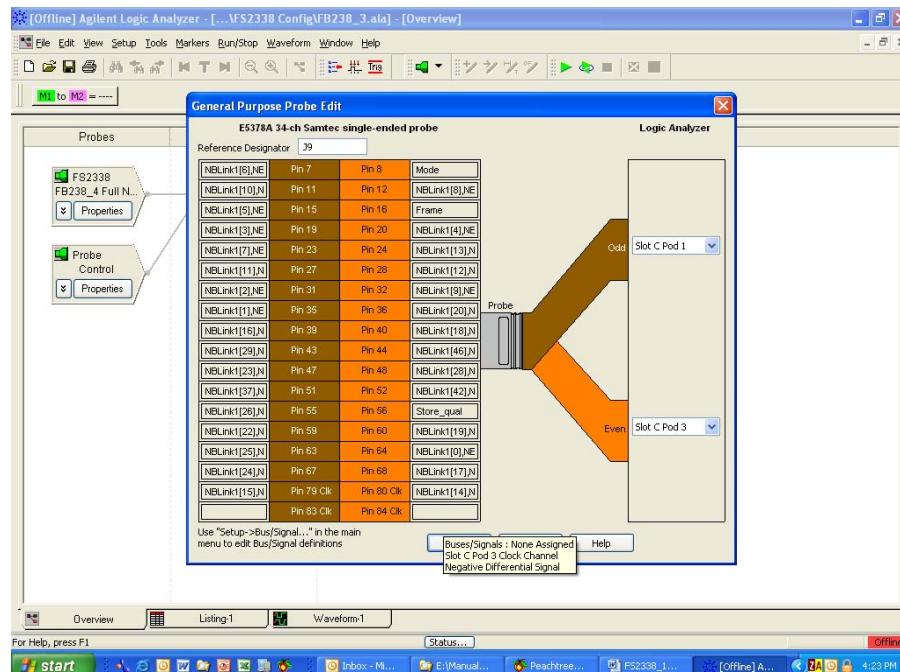
Configuration File Labels

The configuration files provided with the probe software have a number of labels defined that are useful in providing rapid identification of sampling position, DRAM, and Channel Command activity in the state listing. They can also be used as triggers for the logic analyzer. These labels include:

Sampling labels
There are 4 groups of Sampling labels which organize each bit sent for the probe to the logic analyzer by the location of its valid data window and therefore the required sampling position. This makes it more convenient to check the sampling set-up on a bit by bit basis.

DRAM labels
BA_x - Bank Address for Command Slot A, B or C as defined in 3 bits. _x is used to describe the Command slot.

ADD_x - 16 bit label describing the DRAM address bus

DS_x - 4 bits that direct the command to one of the eight possible DRAM DIMMs on the FBD channel. This is how any of the three commands in a frame can be directed to any DIMM in the FBD channel. These bits are used in some Channel Commands as well.

RS_x - Rank Select bit.

Channel Command labels
SB_CMDA_CRC – Southbound Command Slot A CRC 14 bit value.

FO_SB_CMDA_CRC – Failover Southbound Command Slot A CRC 10 bit value

EV_x - Event Debug bits, 8 bits, used in the Channel Command Debug: In band events.

PV_x – 8 bit Parameter Value that is associated with a debug event. This is used in the Channel Command Debug: In band events.

DE_x - 8 bits, each bit refers to the CKE on each DIMM, DE0 would be for DIMM 0, DE1 would be for DIMM1, etc.

RT_x - Relative timing, 10 timing bits communicate relative time of transfer across boundaries. Used in Channel Command Debug: Relative timing.

PH_x - Phase bit, 6 bit field communicates the encoded boundary transfer phase. Used in Channel Command Debug: Relative timing.

EX_x - 17 bit field that communicates debug information, used with Channel Command Debug: Exposed information.

BCST_x - single bit field used in all CKE control commands (commands such as DRAM CKE per DIMM and DRAM CKE per Rank commands). A 1 value targets all DIMMs, if the bit is 0 the command targets only one DIMM specified by the DS bits.

TID – single Transaction identifier bit, used in Write Config. Register Channel Command.

SD - Status delay, 2 bit field used in Sync command. Allows return status data to be delayed by up to 3 frames.

EL0s - The EL0s bit indicates the channel should transition from the L0 state to the L0s state for exactly 42 frames. The L0 state is the state when the channel is ready to accept Channel and DRAM commands. The L0s state is an optional state used in systems that use power management.

ERC - The ERC bit indicates that the channel should transition from L0 state to recalibrate state for exactly 42 frames. Used in Sync frame.

IER – This bit indicates that commands and CRC errors be ignored by the AMB until after the next reset. Used in Sync frame.

A10:2 - Address bus for Read or Write configuration Channel Commands.

Default Trigger
When a configuration file is loaded the default trigger will be set to trigger the analyzer when the Mode bit is = 0 and Frame = 1. When mode and frame are set at these values the AMB will be done with training sequences and the data that is on the channel is properly aligned and can be decoded properly by the decoder.

Symbols

Terms used in the FBDIMM protocol are defined under labels that are referred to as symbols. Symbols can be used in defining triggers or for use in default store qualifications. Below is a list of labels with the symbols defined. When using a label for which symbols are defined, change the hex property to sym to display the symbol representation. A, B and C below refer to the Command slot A, B, C respectively in the Southbound frame.

DRAM commands - A, B, C labels

Symbol	Symbol Value
reserved	00 100x
Enter Power down	00 1010
Exit Self Refresh	00 1011
Enter Self Refresh	00 1100
Auto Refresh	00 1101
Precharge Single	00 1110
Precharge All	00 1111
READ	01 0xxx
WRITE	01 1xxx
ACTIVATE	1x xxxx

Channel Commands - A, B, C labels

Symbol	Symbol Value
Channel NOP	0000 000x
Sync	00000 001x
Soft Channel Reset	0000 010x
reserved	0000 011x
Read Config Reg	0000 100x
Write Config Reg	0000 101x
DRAM CKE per Rank	0000 110x
DRAM CKE per DIMM	0000 111x
reserved2	0001 0xxx
reserved3	0001 10xx
Debug Exposed	0001 110x
Debug Relative	0001 1110
Debug In-Band	0001 1111

Frame Type label

| Symbol	Symbol Value
command	00
Reserved	01
Command + Wdata	1x

The DRAM commands A, B, C labels are made up of bits 20, 19, 18, 12, 11, 10 respectively from each command slot.

Channel Commands A, B, C labels are made up of bits 20-13 respectively from each command slot.

Frame Type label consists of bits 25, 24 respectively.

The picture below shows an example of symbols being used for a trigger.
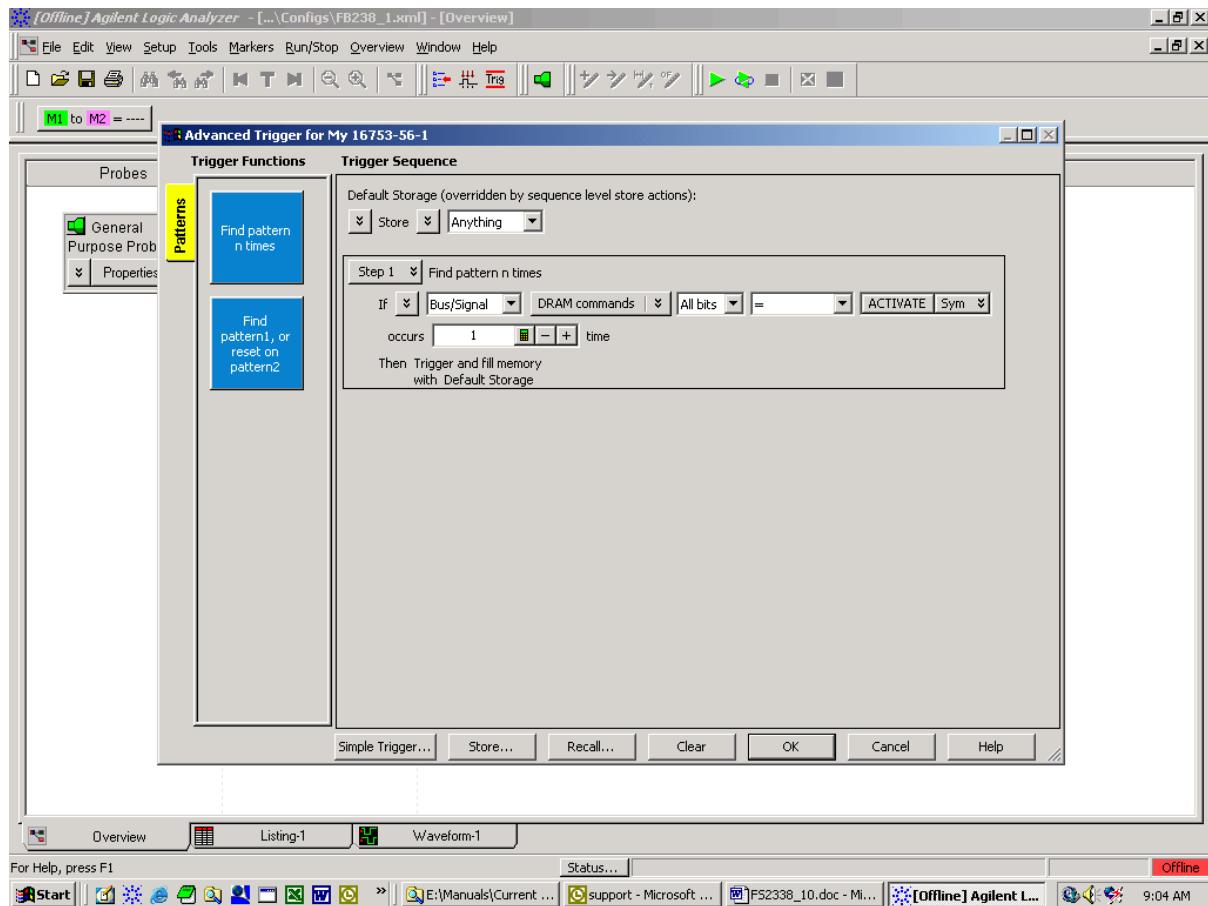
Example using symbol "Activate" in a trigger

Preferences

The preferences option is used to set the protocol decoder for failover mode. If the Southbound or Northbound is in failover mode, the preferences must be set accordingly. If the Northbound side is in failover the user must select which lane has failed in order for the decoder to decode the bus properly. The default settings for both the Northbound and Southbound are set to None, meaning they are both running at full potential. To access the preferences select the Tools menu after a configuration file has been loaded successfully, then select FBDIMM Protocol Decoder -1/Preferences. The following is a picture of the screen when selecting preferences.

Another preference option is Raw Mode. When selected the output on the Northbound and Southbound labels will be shown in a binary format instead of the regular decoded output. All twelve transfers and all lanes will be shown in each state.
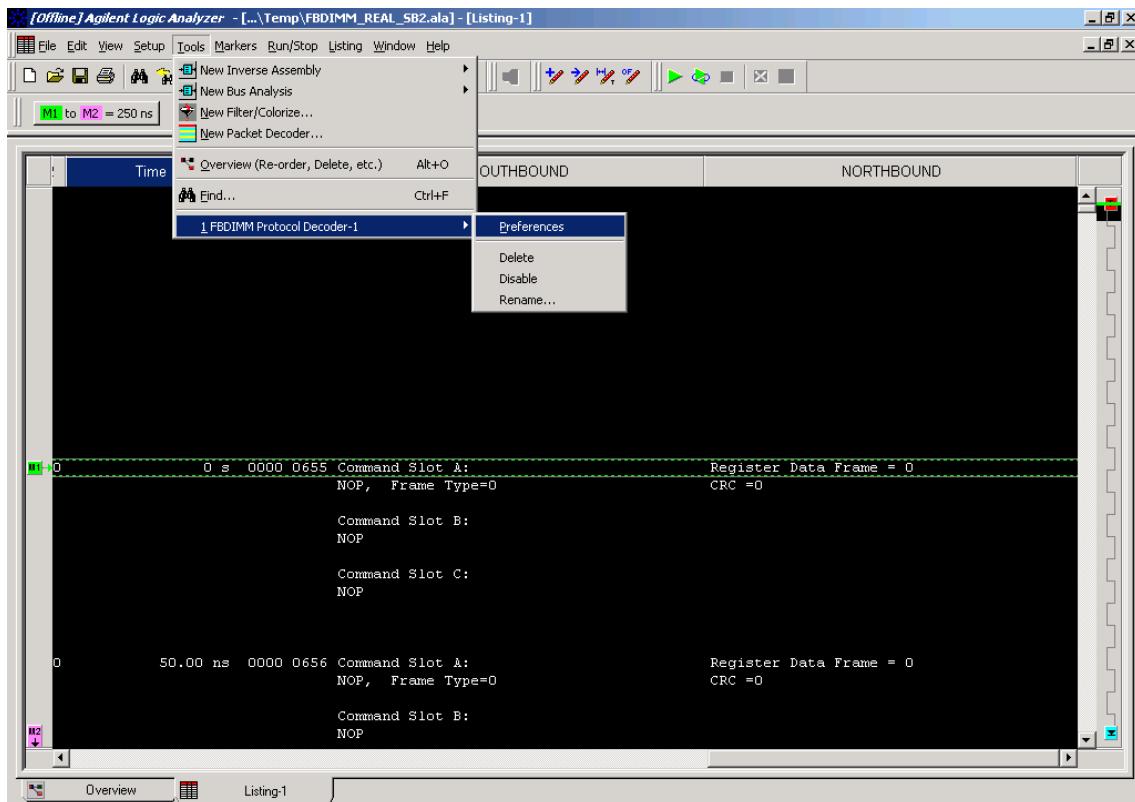
Below is a picture of the preference options
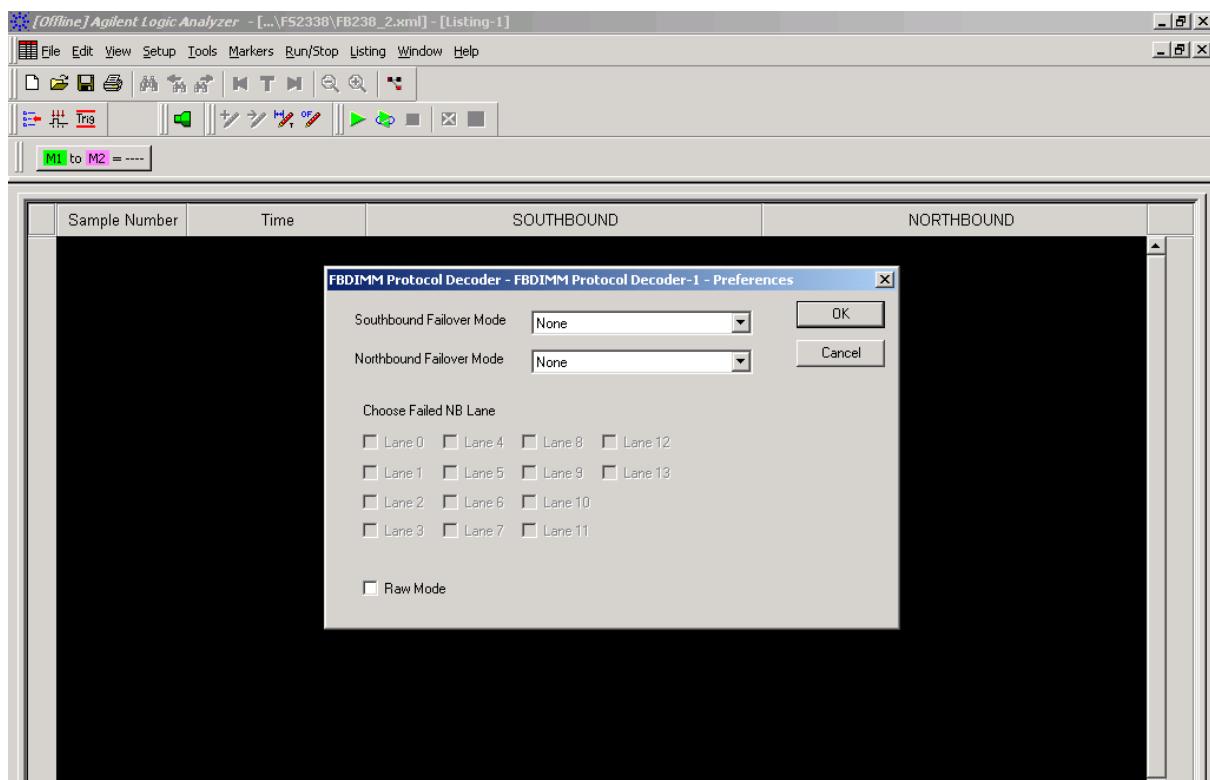
SM (SMBus) Control

Paddle card Settings

The FS2338 probe is designed so that AMB/LAI device control can be either from the 16900 logic analyzer and the Probe Control application software resident there, or from another FS2338 probe (slave mode).

This feature is controlled by means of a 6 position switch on the probe paddle card near the logic analyzer connections.

The factory configuration is for 16900 control of the probe. The settings on the switch are dependent on the configuration file used. The following picture shows the jumper and switch configurations on the paddle card.

SW1

Config file	SW# ON, all others off
FB238_1	1 and 4
FB238_2	1 and 4
FB238_4	1 and 4
FB238_5	1 and 4
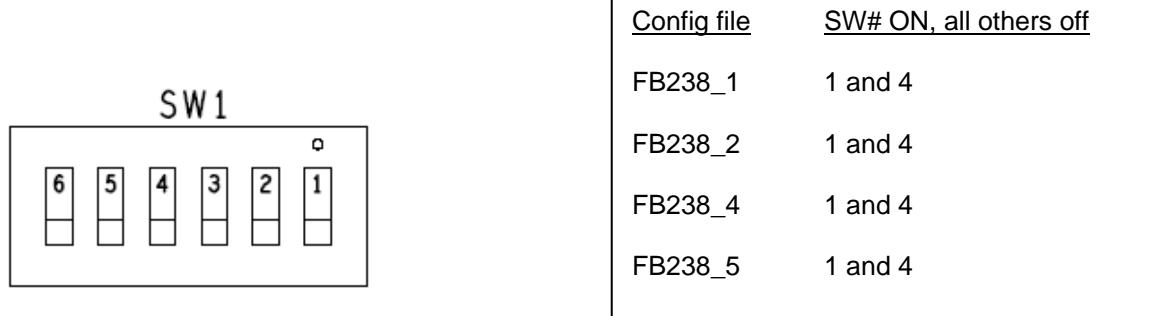
Probe Settings

There is a 4 position jumper location at U8 on the top side of the FS2338 Slot probe. There are jumpers that can be placed over each of the 4 set of pins. They have the following function:
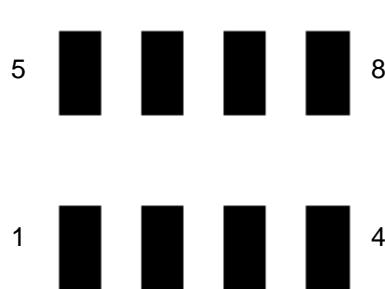
Jumper	Function
1 - 5	Probe ID bit 0 Address 20
2 - 6	Probe ID bit 1 Address 21
3 - 7	Jumper removed = AMB SMBus connected to analyzer at powerup. Factory config – installed Jumper installed = AMB SMBus connected to motherboard at power up.
4 - 8	Unused

Event Bus Cabling
The Event Bus bits, Evbus[0:3], from other probes can be daisy chained across multiple probes in order to provide cross probe control of other probes. There are 2 EV cable connectors on each probe and both connectors are wired in parallel so that either can be used. Additionally, the probe has termination sensing circuitry so that the Evbus[0:3] signals are properly terminated on the probe if the cables are not used.

The cables are connected at either J9 or J10 on the board with their wires exiting the board from the top. LED D1 will light if the cables are attached backwards.

Probe Control Application

The FS2338 Slot probe is controlled from a Probe Add-in; it has to be installed on the 16900 workspace as it communicates through the logic analyzer cards through an internal SM (SMBus) port which is connected to the probe by means of the adapter cable connection.

Loading the Probe Control Software
Load the CD provided with the probe into the 16900 frame and locate the file FBD Probe Control.exe. Double-click this file and it will install and be available in the Agilent Logic analyzer software under the Setup tab as the FS2338 Probe.

Using the Probe Control Software
Always use the "Apply" button before changing windows or using the "OK" button. It is important to note that the probe control software sets up registers within the AMB. It is still necessary to set up parameters in the configuration file for triggers, storing, filtering etc. Setting up the AMB through the probe control software generates signals going to the logic analyzer, the logic analyzer can then use these signals to qualify, trigger or filter events or data of interest.

Please see the following pages for details for the different register settings within the AMB.

Setup
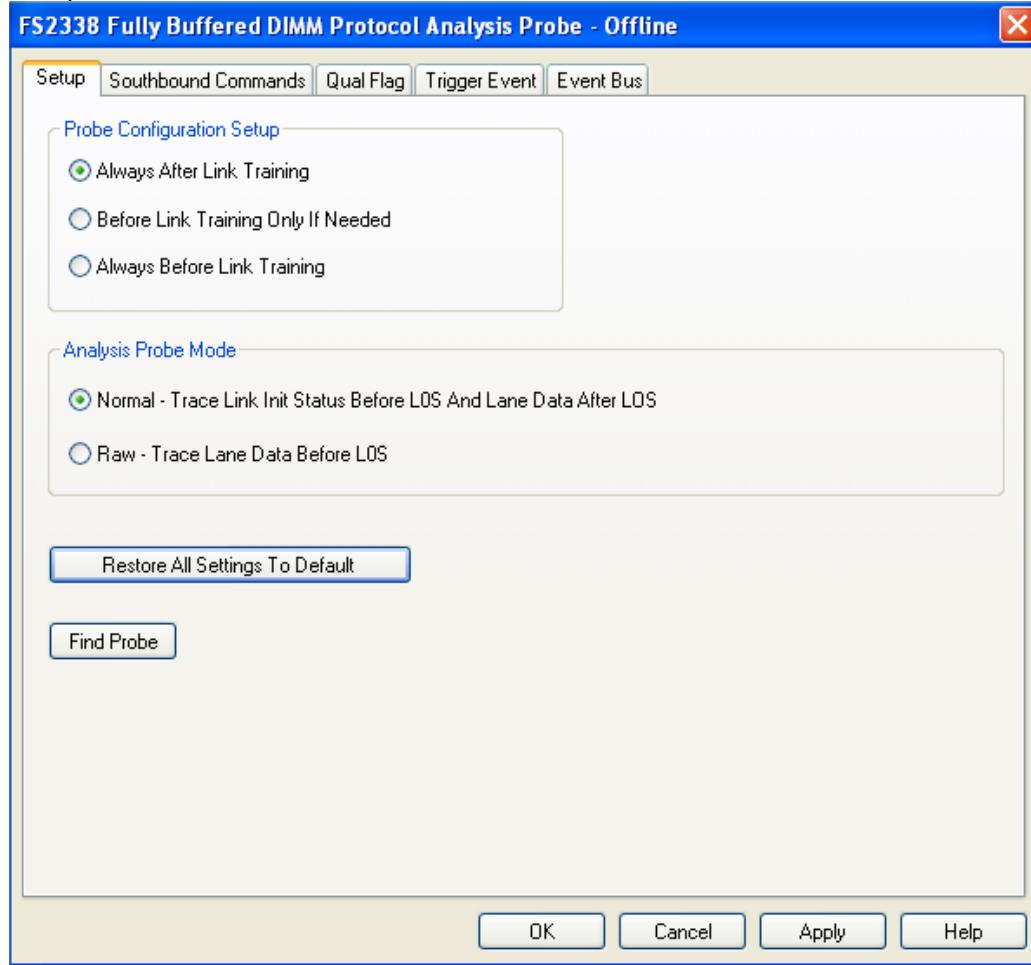
The Set-up screen provides control over basic probe use.

- The probe Configuration setup button allows the user to select when they want to set up the parameters within the AMB. The choices are always after link training, before link training only when needed, or always before link training. If all you are interested in is data after link training then leave always after link training selected.

- The probe can operate in a mode where lane data is only provided after L0s where the lane data is aligned to the clock, or in "raw" mode. Raw mode just passes data through to the logic analyzer, the lane data may not be aligned to the clocks at this point.

- The "Restore" button resets ALL Probe settings to their factory configuration.

- "Find Probe" pings the probe/AMB chip.

SB Commands
This allows Match or Mask control over any 3 Command patterns entered by the user in either Hex or binary format. Furthermore, each of 3 patterns can be searched for in either Command Slot A, B or C, or all three patterns in all 3 Command Slots.

The mask and match feature allows the user to set 3 different command patterns along with data to mask out. The user can then specify 3 events, which allows a user to specify a frame containing 3 command values to be passed to the logic analyzer. When the frame occurs that satisfy the events specified, the data will be passed to the analyzer.
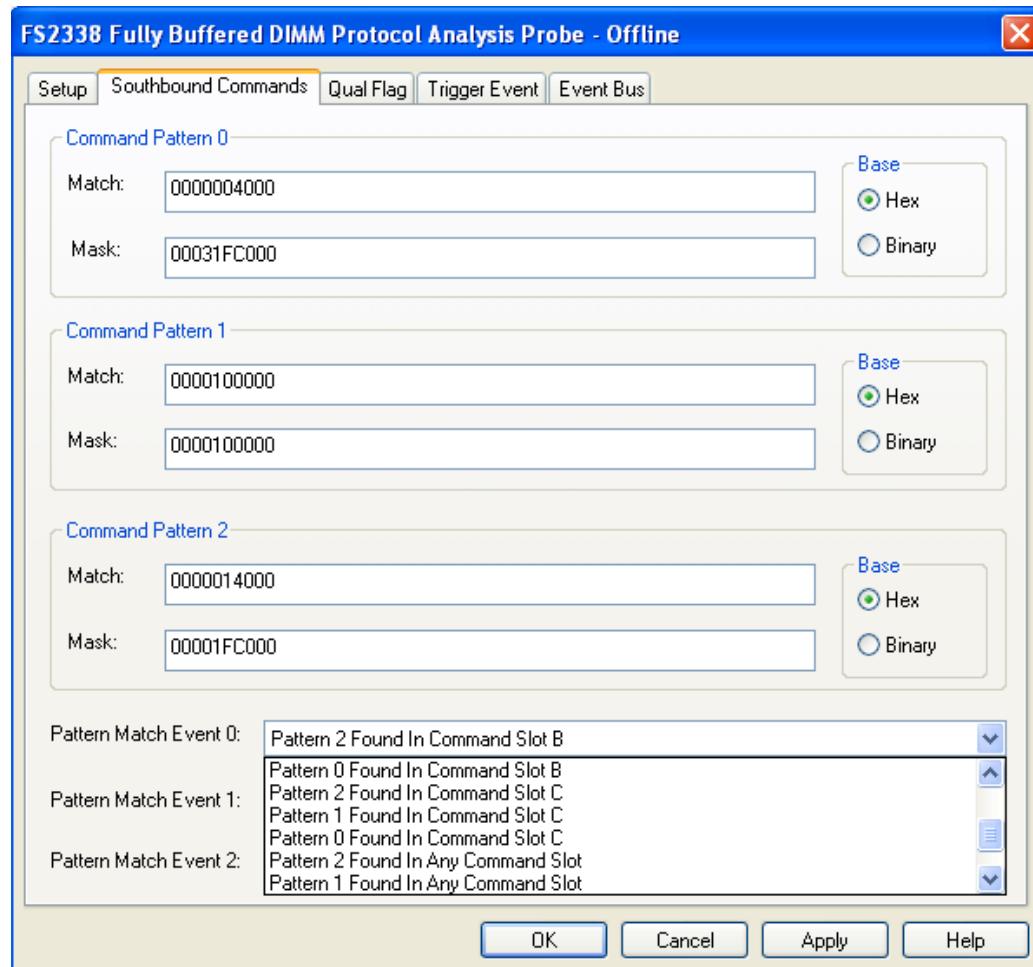
Store Qualification

This section controls the operation of the Qual Flag, Qual Stop Delay, and Qual Period Delay. It allows the user to select from 32 different events for the definition of Qual Start and Qual Stop. These settings control the state of the Store_qual flag for non-filtered frames. The Store_qual flag in the configuration file can then be used for trigger events, default storing, etc. The Store_qual flag is controlled by this screen, the user may specify when to activate the Store_qual flag, specify an event to assert the Store_qual flag, and when to deassert the flag.
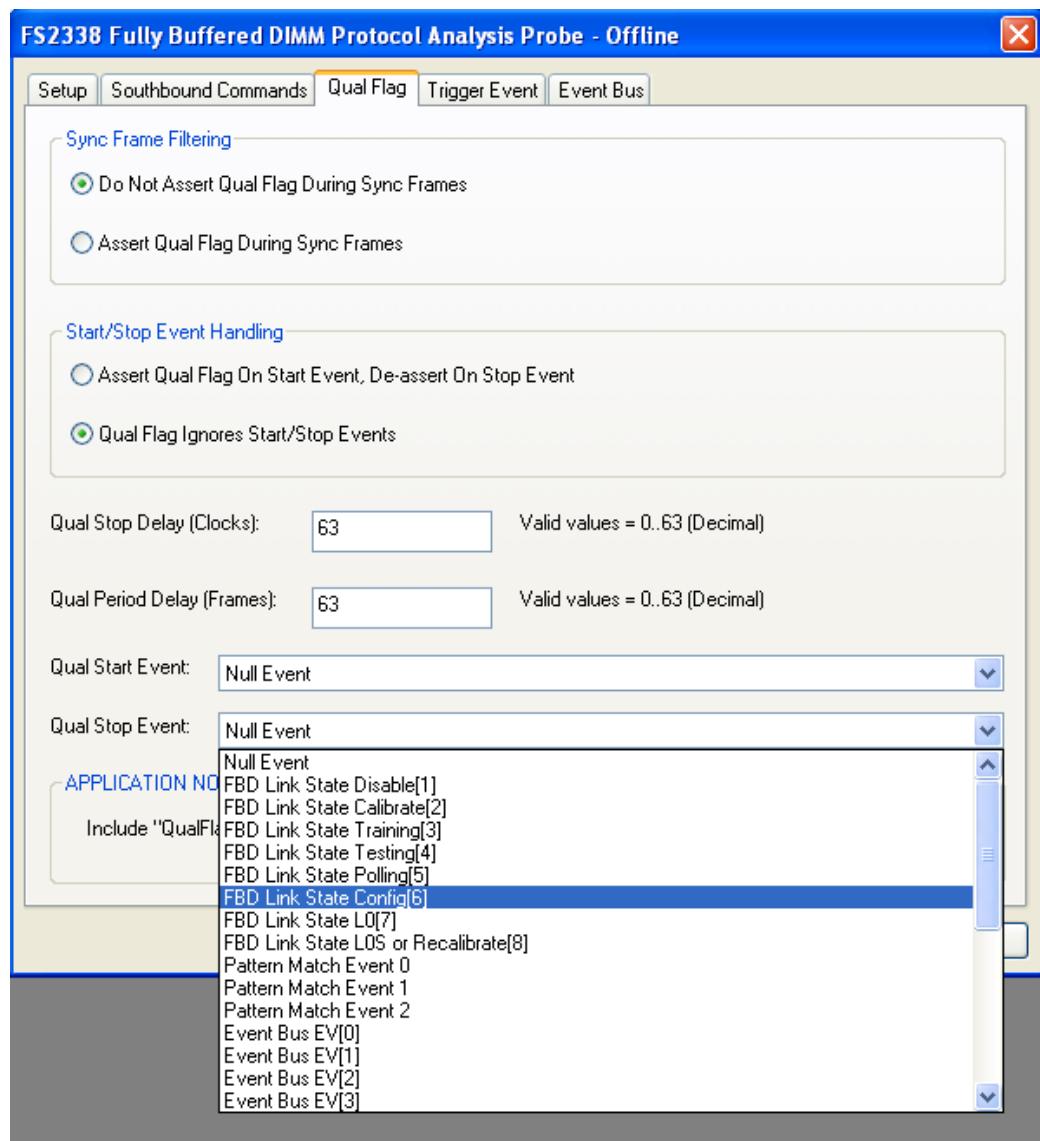
Trigger Events
This capability allows the Probe user to define each of the AMB's logic analyzer Triggers [0:10] to be set to one of 32 different event conditions seen by the AMB. It is important to note that not all LAITrig[0:10] signals are available to the logic analyzer. This is dependent on the configuration file loaded and the pod connections made to the logic analyzer. Each trigger bit has a corresponding label in the configuration file that can be used when specifying a trigger for the logic analyzer.
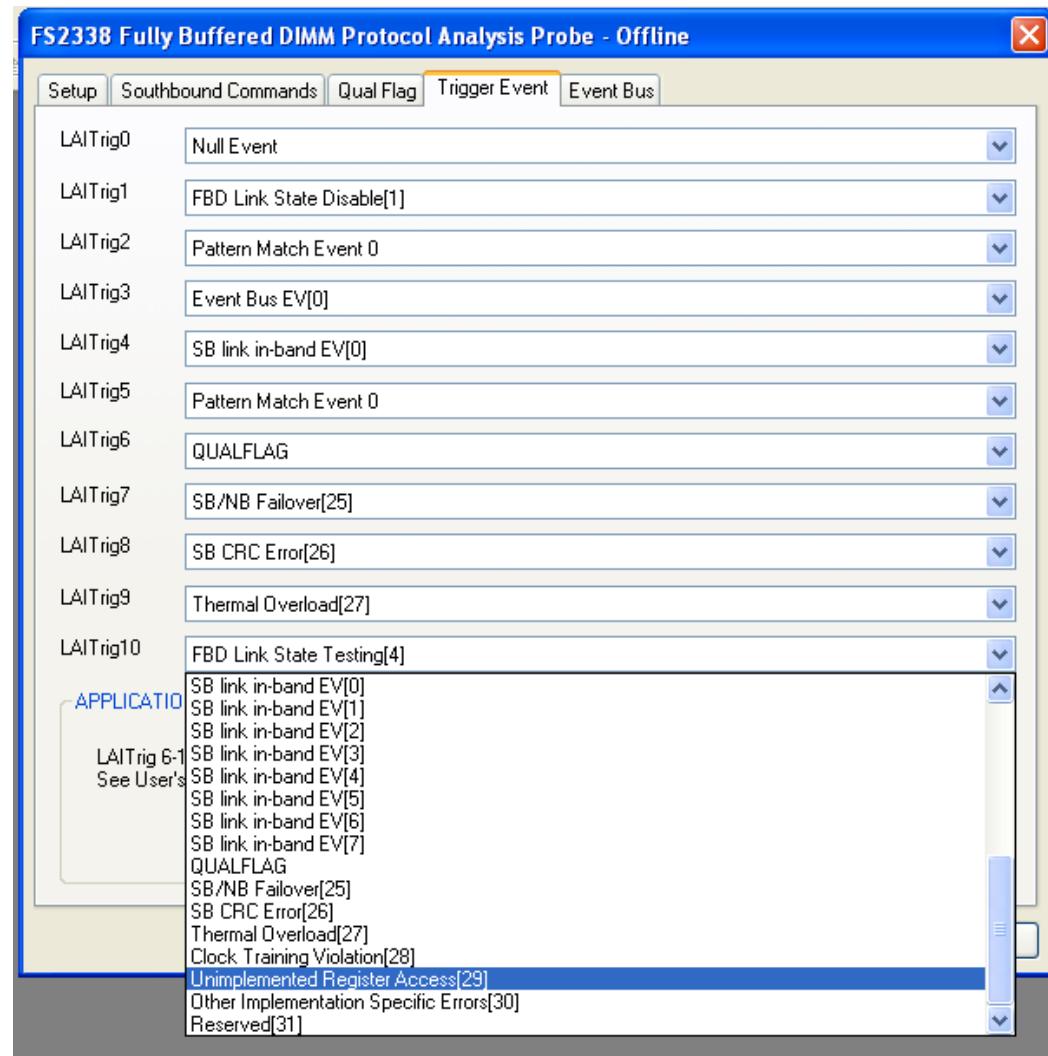
Event Bus
This feature controls the operation of the Event Bus signals EV[0:3] which can be used
for communication and triggering between probes in an FBDIMM Channel.
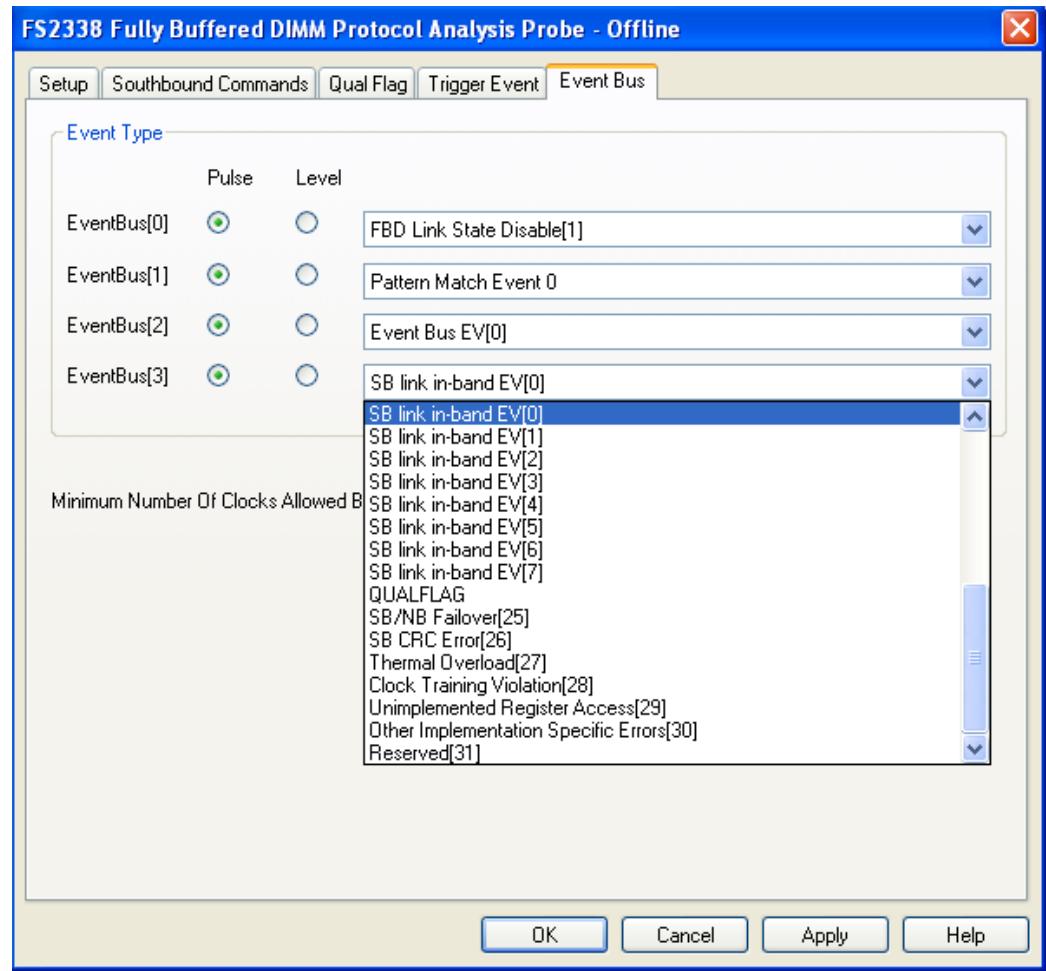
State Analysis Operation

For proper state analysis the user must choose the correct configuration file to load depending on what type of analysis is desired, such as analyzing Northbound and Southbound activity or just one direction. The list of configuration files provided is on page 9.

Load the appropriate configuration file and use the General Purpose probe feature for proper cable attachment to the probe, for more information on the General Purpose probe feature please see the section titled "Loading 169xx configuration files and General Purpose Probe feature". When the configuration file loads the decoder will automatically load providing the software has been properly licensed.

For proper protocol decoder performance you must insure the preferences are set properly. Once the configuration file is loaded go to Tools, select FBDIMM Protocol Decoder -1 and select Preferences. Set the failover modes for the Southbound and or Northbound if necessary. The default settings are set to none. When you choose a Northbound failover mode you must select which lane(s) has failed as well.

Once the configuration file has been loaded and all cables are attached to the probe, the next step is to configure the probe. Please refer to the section of the manual titled "Using the Probe Control Application". The probe control application allows the user to set different parameters of the probe to allow certain data to be passed through to the analyzer.

Setting Sample Positions

In order to insure that the logic analyzer properly measures the output of the probe, the sample positions for each label need to be set properly. There are 4 "Sample Data" labels defined in each configuration file that group each North and Southbound data signal by its required sample position.

It is recommended that Eyefinder is run on the logic analyzer while the target system is generating consistent traffic on the North and Southbound lanes. The sample positions in the config fields have been preset based on measurements in a test bed at 533MT/s data rates. They may need to be adjusted based on your target system. The following image shows the 4 "Sample Data" labels after an Eyefinder has been run. If there are clear eyes for each label, the user can drag all the blue sample position bars to the far left to aggregate them and then drag the single bar back to the window where it was originally located. If the sample positions are not set correctly then the data shown on the analyzer will not be correct.
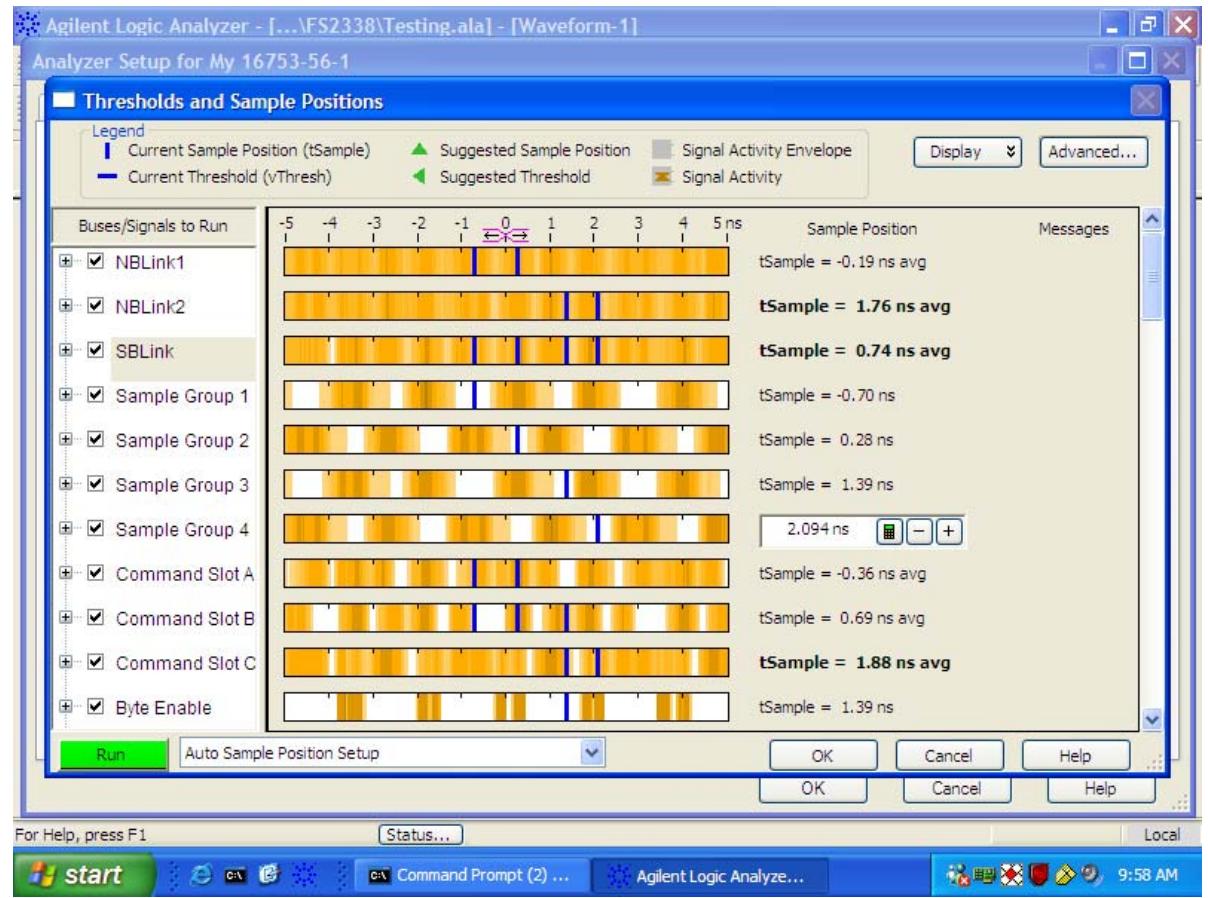
After the probe has been configured, the trigger for the analyzer must be set. To set the trigger for the analyzer go to the setup menu bar and select "Advanced Trigger". On the next window that pops up specify what you want the analyzer to trigger on. After you set the trigger, depress the run button (green arrow at the top of the screen on the overview, listing or waveform windows), the analyzer should be waiting for a trigger to occur at this point. Start a test on the target to generate traffic, when the trigger condition is satisfied the analyzer will continue capturing data until the memory is full or the user has depressed the stop button.

When the analyzer has stopped the protocol decoder will automatically decode the data on the bus, the decoded data will appear under the Northbound and Southbound labels on the listing screen.

State Display
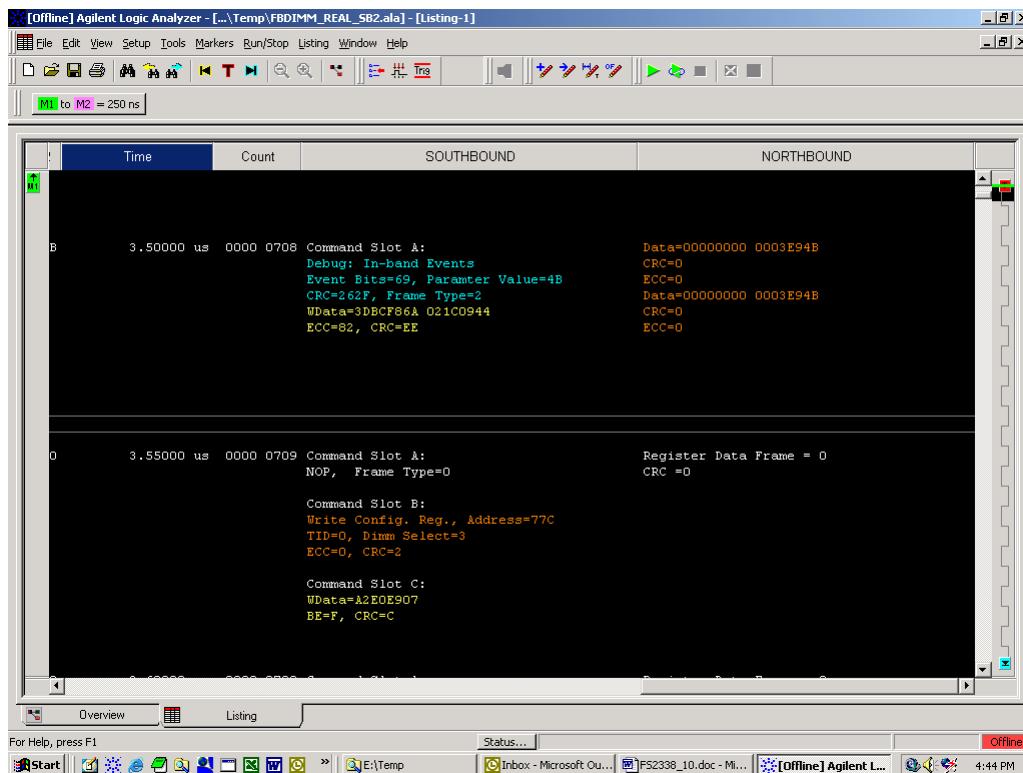
Offline Analysis

Offline analysis allows a user to be able to analyze a trace offline at a PC so it frees up the analyzer for another person to use the analyzer to capture data.

If you have already used the Protocol Decoder license that was included with your package on a 1680/90/900 analyzer and would like to have the offline analysis feature on a PC you may buy additional licenses, please contact FuturePlus Sales department.

In order to view decoded data offline, after installing the 1680/90/900 operating system on a PC, you must install the FuturePlus software. Please follow the installation instructions for "Setting up the 16900 analyzer". Once the FuturePlus software has been installed and licensed follow these steps to import the data and view it.

From the desktop, double click on the Agilent logic analyzer icon. When the application comes up there will be a series of questions, answer the first question asking which startup option to use, select Continue Offline. On the analyzer type question, select cancel. When the application comes all the way up you should have a blank screen with a menu bar and tool bar at the top.

For data from a 16900 analyzer, open the .ala file using the File, Open menu selections and browse to the desired .ala file.
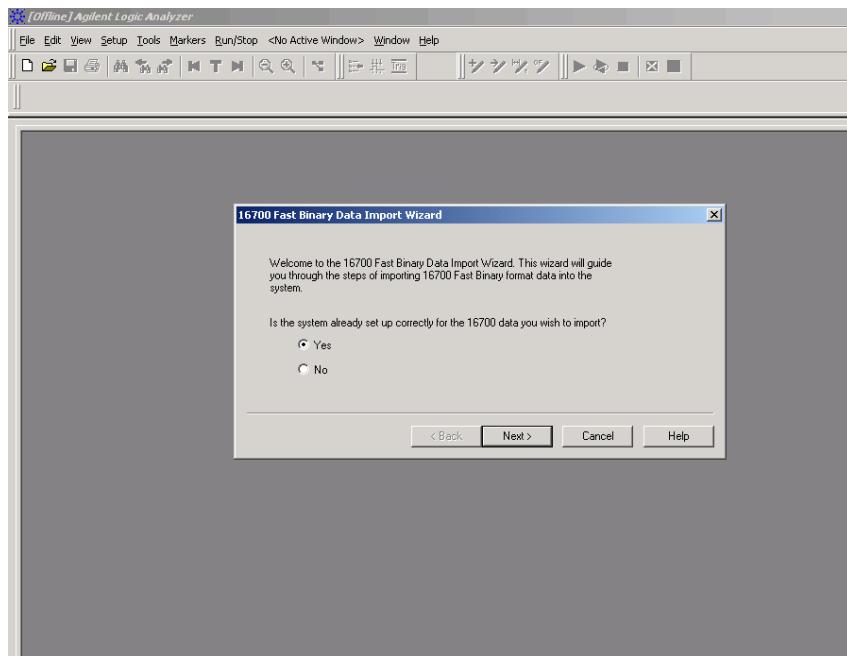
After clicking "next" you must browse for the fast binary data file you want to import. Once you have located the file and clicked start import, the data should appear in the listing.

After the data has been imported you must load the protocol decoder before you will see any decoding. To load the decoder select Tools from the menu bar, when the drop down menu appears select Inverse Assembler, then choose the name of the decoder for your particular product. **The figure below is a general picture; please choose the appropriate decoder for the trace you are working with**.
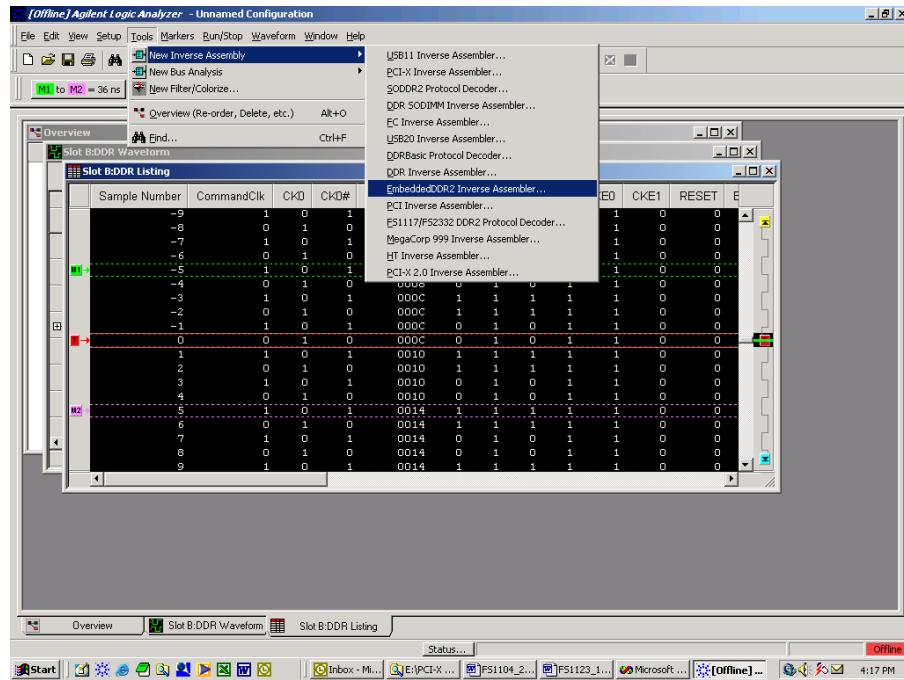
After the decoder has loaded, select Preferences from the overview screen and set the preferences to their correct value in order to decode the trace properly.

Appendix

FS2338 Paddle Signal to Logic Analyzer Connector and Channel Mapping

The following table shows how the FS2338 Probe connects FBDIMM AMB signals to the logic analyzer pods and channels through the 100 pin Samtec connectors. Note that the configuration files described earlier use various combinations of these Pod connections.

The nomenclature is NB/SB for North or Southbound, Lx for Lane number, Bx for bit in during the rising edge of Anly_clkp, and _xx is the bit for the Dual sampled (second) point which is on the falling edge of Anly_clkp.

J9 - Pods 1(Odd) and 2 (Even)

Signal name/Logical Signal Name	Logic Analyzer channel number	SAMTEC Pin number	SAMTEC Pin number	Logic Analyzer channel number	Signal Name/Logical Signal name
	Ground	1	2	Ground	
	NC	3	4	NC	
	Ground	5	6	Ground	
NB_L1_B0_6	Odd D0	7	8	Even D0	MODE
	Ground	9	10	Ground	
NB_L1_B4_10	Odd D1	11	12	Even D1	NB_L1_B2_8
	Ground	13	14	Ground	
NB_L0_B5_11	Odd D2	15	16	Even D2	FRAME
	Ground	17	18	Ground	
NB_L0_B3_9	Odd D3	19	20	Even D3	NB_L0_B4_10
	Ground	21	22	Ground	
NB_L1_B1_7	Odd D4	23	24	Even D4	NB_L2_B1_7
	Ground	25	26	Ground	
NB_L1_B5_11	Odd D5	27	28	Even D5	NB_L2_B0_6
	Ground	29	30	Ground	
NB_L0_B2_8	Odd D6	31	32	Even D6	NB_L1_B3_9
	Ground	33	34	Ground	
NB_L0_B1_7	Odd D7	35	36	Even D7	NB_L3_B2_8
	Ground	37	38	Ground	
NB_L2_B4_10	Odd D8	39	40	Even D8	NB_L3_B0_6
	Ground	41	42	Ground	

Signal name/Logical Signal Name	Logic Analyzer channel number	SAMTEC Pin number	SAMTEC Pin number	Logic Analyzer channel number	Signal Name/Logical Signal name
NB_L4_B5_11	Odd D9	43	44	Even D9	NB_L7_B4_10
	Ground	45	46	Ground	
NB_L3_B5_11	Odd D10	47	48	Even D10	NB_L4_B4_10
	Ground	49	50	Ground	
NB_L6_B1_7	Odd 11	51	52	Even D11	NB_L7_B0_6
	Ground	53	54	Ground	
NB_L4_B2_8	Odd D12	55	56	Even D12	STORE_QUAL
	Ground	57	58	Ground	
NB_L3_B4_10	Odd D13	59	60	Even D13	NB_L3_B1_7
	Ground	61	62	Ground	
NB_L4_B1_7	Odd D14	63	64	Even D14	NB_L0_B0_6
	Ground	65	66	Ground	
NB_L4_B0_6	Odd D15	67	68	Even D15	NB_L2_B5_11
	Ground	69	70	Ground	
	NC	71	72	NC	
	Ground	73	74	Ground	
	NC	75	76	NC	
	Ground	77	78	Ground	
NB_L2_B3_9	Odd D16P/Odd CLK	79	80	Even DP16P/Even CLK	NB_L2_B2_8
	Ground	81	82	Ground	
GND	Odd DP16N/Odd CLKN	83	84	Even DP16N/Even CLKN	GND
	Ground	85	86	Ground	
	Odd External Ref	87	88	Even External Ref	
	Ground	89	90	Ground	
	NC	91	92	NC	
	Ground	93	94	Ground	
	Ground	95	96	Ground	
		97	98		
		99	100		

J11 Pods 1(Odd) and 2 (Even)

Signal name/Logical Signal Name	Logic Analyzer channel number	SAMTEC Pin number	SAMTEC Pin number	Logic Analyzer channel number	Signal Name/Logical Signal name
	Ground	1	2	Ground	
SDA	SM	3	4	SM	SCL
	Ground	5	6	Ground	
NB_L8_B5_11	Odd D0	7	8	Even D0	NB_L10_B5_11
	Ground	9	10	Ground	
NB_L10_B1_7	Odd D1	11	12	Even D1	NB_L8_B1_7
	Ground	13	14	Ground	
NB_L10_B2_8	Odd D2	15	16	Even D2	NB_L10_B3_9
	Ground	17	18	Ground	
NB_L5_B2_8	Odd D3	19	20	Even D3	NB_L6_B2_8
	Ground	21	22	Ground	
NB_L6_B3_9	Odd D4	23	24	Even D4	NB_L8_B4_10
	Ground	25	26	Ground	
NB_L11_B3_9	Odd D5	27	28	Even D5	NB_L8_B3_9
	Ground	29	30	Ground	
NB_L5_B0_6	Odd D6	31	32	Even D6	NB_L11_B0_6
	Ground	33	34	Ground	
NB_L11_B4_10	Odd D7	35	36	Even D7	NB_L3_B3_9
	Ground	37	38	Ground	
NB_L5_B5_11	Odd D8	39	40	Even D8	NB_L11_B2_8
	Ground	41	42	Ground	
NB_L4_B3_9	Odd D9	43	44	Even D9	NB_L5_B3_9
	Ground	45	46	Ground	
NB_L6_B5_11	Odd D10	47	48	Even D10	NB_L5_B1_7
	Ground	49	50	Ground	
NB_L6_B0_6	Odd 11	51	52	Even D11	NB_L9_B2_8
	Ground	53	54	Ground	
NB_L8_B2_8	Odd D12	55	56	Even D12	NB_L9_B5_11
	Ground	57	58	Ground	

Signal name/Logical Signal Name	Logic Analyzer channel number	SAMTEC Pin number	SAMTEC Pin number	Logic Analyzer channel number	Signal Name/Logical Signal name
NB_L11_B1_7	Odd D13	59	60	Even D13	NB_L9_B3_9
	Ground	61	62	Ground	
NB_L7_B5_11	Odd D14	63	64	Even D14	NB_L5_B4_10
	Ground	65	66	Ground	
NB_L8_B0_6	Odd D15	67	68	Even D15	NB_L10_B4_10
	Ground	69	70	Ground	
	NC	71	72	NC	
	Ground	73	74	Ground	
	NC	75	76	NC	
	Ground	77	78	Ground	
NB_L11_B5_11	Odd D16P/Odd CLK	79	80	Even DP16P/Even CLK	NB_L9_B0_6
	Ground	81	82	Ground	
GND	Odd DP16N/Odd CLKN	83	84	Even DP16N/Even CLKN	GND
	Ground	85	86	Ground	
	Odd External Ref	87	88	Even External Ref	
	Ground	89	90	Ground	
	NC	91	92	NC	
	Ground	93	94	Ground	
	Ground	95	96	Ground	
		97	98		
		99	100		

J15 Pod 1(Odd)

Signal name/Logical Signal Name	Logic Analyzer channel number	SAMTEC Pin number	SAMTEC Pin number	Logic Analyzer channel number	Signal Name/Logical Signal name
	Ground	1	2	Ground	
	NC	3	4	NC	
	Ground	5	6	Ground	
TRIGGER7*	Odd D0	7	8	Even D0	
	Ground	9	10	Ground	
NB_L7_B3_9*	Odd D1	11	12	Even D1	
	Ground	13	14	Ground	
NB_L7_B1_7*	Odd D2	15	16	Even D2	
	Ground	17	18	Ground	
NB_L7_B2_8*	Odd D3	19	20	Even D3	
	Ground	21	22	Ground	
NB_L6_B4_10*	Odd D4	23	24	Even D4	
	Ground	25	26	Ground	
NB_L9_B1_7*	Odd D5	27	28	Even D5	
	Ground	29	30	Ground	
TRIGGER8*	Odd D6	31	32	Even D6	
	Ground	33	34	Ground	
TRIGGER9*	Odd D7	35	36	Even D7	
	Ground	37	38	Ground	
TRIGGER10*	Odd D8	39	40	Even D8	
	Ground	41	42	Ground	
TRIGGER6*	Odd D9	43	44	Even D9	
	Ground	45	46	Ground	
TRIGGER5*	Odd D10	47	48	Even D10	
	Ground	49	50	Ground	
NB_L10_B0_6*	Odd 11	51	52	Even D11	
	Ground	53	54	Ground	
NB_L9_B4_10*	Odd D12	55	56	Even D12	
	Ground	57	58	Ground	
TRIGGER0*	Odd D13	59	60	Even D13	
	Ground	61	62	Ground	

Signal name/Logical Signal Name	Logic Analyzer channel number	SAMTEC Pin number	SAMTEC Pin number	Logic Analyzer channel number	Signal Name/Logical Signal name
TRIGGER1*	Odd D14	63	64	Even D14	
	Ground	65	66	Ground	
TRIGGER2*	Odd D15	67	68	Even D15	
	Ground	69	70	Ground	
	NC	71	72	NC	
	Ground	73	74	Ground	
	NC	75	76	NC	
	Ground	77	78	Ground	
Anly_clkp	Odd D16P/Odd CLK	79	80	Even DP16P/Even CLK	
	Ground	81	82	Ground	
Anly_clkn	Odd DP16N/Odd CLKN	83	84	Even DP16N/Even CLKN	
	Ground	85	86	Ground	
	Odd External Ref	87	88	Even External Ref	
	Ground	89	90	Ground	
	NC	91	92	NC	
	Ground	93	94	Ground	
	Ground	95	96	Ground	
		97	98		
		99	100		

* - jumper resistor needs to be added at R7 – R16

J12 Pods 1(Odd)

Signal name/Logical Signal Name	Logic Analyzer channel number	SAMTEC Pin number	SAMTEC Pin number	Logic Analyzer channel number	Signal Name/Logical Signal name
	Ground	1	2	Ground	
	NC	3	4	NC	
	Ground	5	6	Ground	
NB_L13_B2_8	Odd D0	7	8	Even D0	
	Ground	9	10	Ground	
NB_L7_B3_9	Odd D1	11	12	Even D1	
	Ground	13	14	Ground	
NB_L7_B1_7	Odd D2	15	16	Even D2	
	Ground	17	18	Ground	
NB_L7_B2_8	Odd D3	19	20	Even D3	
	Ground	21	22	Ground	
NB_L6_B4_10	Odd D4	23	24	Even D4	
	Ground	25	26	Ground	
NB_L9_B1_7	Odd D5	27	28	Even D5	
	Ground	29	30	Ground	
NB_L13_B4_10	Odd D6	31	32	Even D6	
	Ground	33	34	Ground	
NB_L13_B3_9	Odd D7	35	36	Even D7	
	Ground	37	38	Ground	
NB_L13_B0_6	Odd D8	39	40	Even D8	
	Ground	41	42	Ground	
NB_L13_B1_7	Odd D9	43	44	Even D9	
	Ground	45	46	Ground	
NB_L13_B5_11	Odd D10	47	48	Even D10	
	Ground	49	50	Ground	
NB_L10_B0_6	Odd 11	51	52	Even D11	
	Ground	53	54	Ground	
NB_L9_B4_10	Odd D12	55	56	Even D12	
	Ground	57	58	Ground	
TRIGGER0	Odd D13	59	60	Even D13	

Signal name/Logical Signal Name	Logic Analyzer channel number	SAMTEC Pin number	SAMTEC Pin number	Logic Analyzer channel number	Signal Name/Logical Signal name
	Ground	61	62	Ground	
TRIGGER1	Odd D14	63	64	Even D14	
	Ground	65	66	Ground	
TRIGGER2	Odd D15	67	68	Even D15	
	Ground	69	70	Ground	
	NC	71	72	NC	
	Ground	73	74	Ground	
	NC	75	76	NC	
	Ground	77	78	Ground	
TRIGGER4	Odd D16P/Odd CLK	79	80	Even DP16P/Even CLK	
	Ground	81	82	Ground	
GND	Odd DP16N/Odd CLKN	83	84	Even DP16N/Even CLKN	
	Ground	85	86	Ground	
	Odd External Ref	87	88	Even External Ref	
	Ground	89	90	Ground	
	NC	91	92	NC	
	Ground	93	94	Ground	
	Ground	95	96	Ground	
		97	98		
		99	100		

J10 - Pods 1(Odd) and 2 (Even)

Signal name/Logical Signal Name	Logic Analyzer channel number	SAMTEC Pin number	SAMTEC Pin number	Logic Analyzer channel number	Signal Name/Logical Signal name
	Ground	1	2	Ground	
SDA	SM	3	4	SM	SCL
	Ground	5	6	Ground	
SB_L7_B3_9	Odd D0	7	8	Even D0	SB_L7_B0_6
	Ground	9	10	Ground	
SB_L8_B3_9	Odd D1	11	12	Even D1	SB_L9_B4_10
	Ground	13	14	Ground	
SB_L7_B4_10	Odd D2	15	16	Even D2	SB_L9_B5_11
	Ground	17	18	Ground	
SB_L8_B2_8	Odd D3	19	20	Even D3	SB_L8_B1_7
	Ground	21	22	Ground	
SB_L8_B4_10	Odd D4	23	24	Even D4	SB_L9_B0_6
	Ground	25	26	Ground	
SB_L9_B3_9	Odd D5	27	28	Even D5	SB_L9_B2_8
	Ground	29	30	Ground	
SB_L7_B2_8	Odd D6	31	32	Even D6	SB_L8_B0_6
	Ground	33	34	Ground	
SB_L9_B1_7	Odd D7	35	36	Even D7	SB_L8_B5_11
	Ground	37	38	Ground	
SB_L5_B4_10	Odd D8	39	40	Even D8	SB_L7_B5_11
	Ground	41	42	Ground	
SB_L7_B1_7	Odd D9	43	44	Even D9	SB_L2_B2_8
	Ground	45	46	Ground	
SB_L5_B2_8	Odd D10	47	48	Even D10	SB_L3_B4_10
	Ground	49	50	Ground	
SB_L2_B0_6	Odd 11	51	52	Even D11	SB_L2_B1_7
	Ground	53	54	Ground	
SB_L0_B0_6	Odd D12	55	56	Even D12	SB_L2_B3_9
	Ground	57	58	Ground	
SB_L1_B1_7	Odd D13	59	60	Even D13	SB_L6_B1_7

Signal name/Logical Signal Name	Logic Analyzer channel number	SAMTEC Pin number	SAMTEC Pin number	Logic Analyzer channel number	Signal Name/Logical Signal name
	Ground	61	62	Ground	
SB_L6_B2_8	Odd D14	63	64	Even D14	SB_L0_B3_9
	Ground	65	66	Ground	
SB_L6_B4_10	Odd D15	67	68	Even D15	SB_L0_B1_7
	Ground	69	70	Ground	
	NC	71	72	NC	
	Ground	73	74	Ground	
	NC	75	76	NC	
	Ground	77	78	Ground	
Anly_clk1p	Odd D16P/Odd CLK	79	80	Even DP16P/Even CLK	SB_L0_B2_8
	Ground	81	82	Ground	
Anly_clk1n	Odd DP16N/Odd CLKN	83	84	Even DP16N/Even CLKN	Ground
	Ground	85	86	Ground	
	Odd External Ref	87	88	Even External Ref	
	Ground	89	90	Ground	
	NC	91	92	NC	
	Ground	93	94	Ground	
	Ground	95	96	Ground	
		97	98		
		99	100		

J13 Pods 1(Odd) and 2 (Even)

Signal name/Logical Signal Name	Logic Analyzer channel number	SAMTEC Pin number	SAMTEC Pin number	Logic Analyzer channel number	Signal Name/Logical Signal name
	Ground	1	2	Ground	
	NC	3	4	NC	
	Ground	5	6	Ground	
NB_L12_B1_7	Odd D0	7	8	Even D0	SB_L6_B3_9
	Ground	9	10	Ground	
NB_L12_B2_8	Odd D1	11	12	Even D1	SB_L4_B3_9
	Ground	13	14	Ground	
NB_L12_B3_9	Odd D2	15	16	Even D2	SB_L4_B5_11
	Ground	17	18	Ground	
NB_L12_B5_11	Odd D3	19	20	Even D3	SB_L4_B2_8
	Ground	21	22	Ground	
NB_L12_B4_10	Odd D4	23	24	Even D4	SB_L1_B4_10
	Ground	25	26	Ground	
NB_L12_B0_6	Odd D5	27	28	Even D5	SB_L1_B0_6
	Ground	29	30	Ground	
SB_L5_B3_9	Odd D6	31	32	Even D6	SB_L2_B5_11
	Ground	33	34	Ground	
SB_L1_B3_9	Odd D7	35	36	Even D7	SB_L0_B4_10
	Ground	37	38	Ground	
SB_L1_B5_11	Odd D8	39	40	Even D8	SB_L4_B4_10
	Ground	41	42	Ground	
SB_L4_B1_7	Odd D9	43	44	Even D9	SB_L1_B2_8
	Ground	45	46	Ground	
SB_L3_B5_11	Odd D10	47	48	Even D10	SB_L2_B4_10
	Ground	49	50	Ground	
SB_L3_B2_8	Odd 11	51	52	Even D11	SB_L5_B0_6
	Ground	53	54	Ground	
SB_L0_B5_11	Odd D12	55	56	Even D12	SB_L3_B3_9
	Ground	57	58	Ground	

Signal name/Logical Signal Name	Logic Analyzer channel number	SAMTEC Pin number	SAMTEC Pin number	Logic Analyzer channel number	Signal Name/Logical Signal name
SB_L4_B0_6	Odd D13	59	60	Even D13	SB_L6_B0_6
	Ground	61	62	Ground	
SB_L3_B0_6	Odd D14	63	64	Even D14	SB_L5_B5_11
	Ground	65	66	Ground	
SB_L3_B1_7	Odd D15	67	68	Even D15	SB_L6_B5_11
	Ground	69	70	Ground	
	NC	71	72	NC	
	Ground	73	74	Ground	
	NC	75	76	NC	
	Ground	77	78	Ground	
TRIGGER3	Odd D16P/Odd CLK	79	80	Even DP16P/Even CLK	SB_L5_B1_7
	Ground	81	82	Ground	
GND	Odd DP16N/Odd CLKN	83	84	Even DP16N/Even CLKN	Ground
	Ground	85	86	Ground	
	Odd External Ref	87	88	Even External Ref	
	Ground	89	90	Ground	
	NC	91	92	NC	
	Ground	93	94	Ground	
	Ground	95	96	Ground	
		97	98		
		99	100		

General Information

This chapter provides additional reference information including the characteristics and signal connections for the FS2338 FBDIMM Slot Probe. The following operating characteristics are not specifications, but are typical operating characteristics.

Probe Connection
240 pin gold finger card edge connection at target (bottom) end of probe conforming to JEDEC spec MO-224.

Protocol supported
The FS2338 is designed to probe a DDR2 Fully Buffered DIMM system. Contact FuturePlus Systems for more detailed information.

Logic Analyzer required
169xx or PC running Agilent technologies 1680/90/900 software version 3.00.00 software, using 16753 or better, 1695x or better cards.

Logic Analyzer Adapter Cables required

Logic Analyzer card	Termination Adapter	Number Required
16753/4/5/6, 16950	E5378A	6

Service requirements
If a failure is suspected in the FS2338 Probe contact the factory or your FuturePlus Systems authorized distributor.

The repair strategy for the probe is for the product to be returned to the factory upon factory approval.